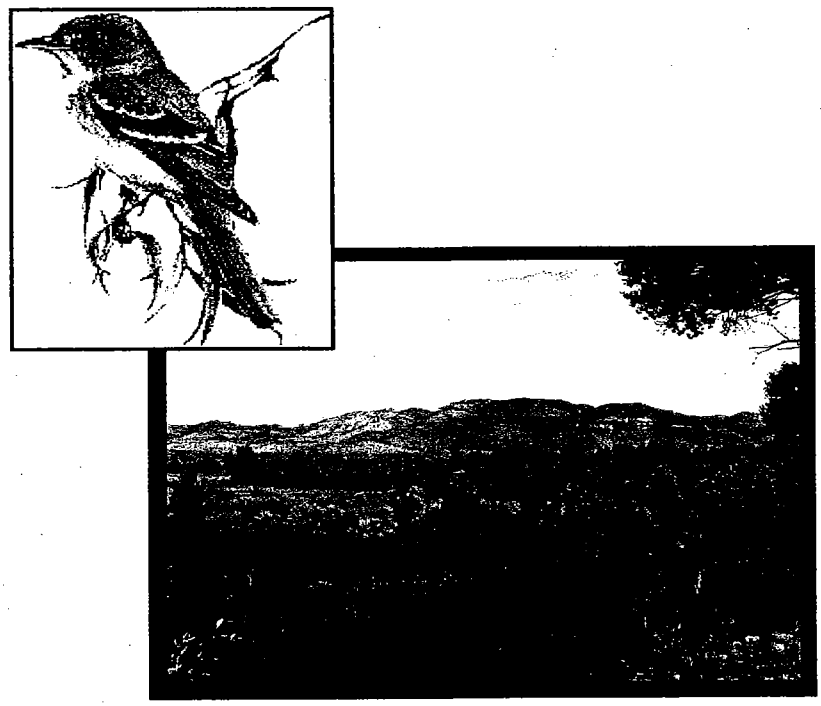
Attached to
Comment No. O-017 R1
List of other Attachments
enumerated in comment No.

SOUTHWESTERN WILLOW FLYCATCHER IN THE CLIFF-GILA VALLEY

CH 13 www

RESULTS OF NEST MONITORING AND CLIMATIC INFLUENCES ON BREEDING

SUMMARY REPORT FOR THE 2002 FIELD SEASON
OCTOBER 2002



Katherine M. Brodhead, Deborah M. Finch & Scott H. Stoleson
Rocky Mountain Research Station
333 Broadway SE, Suite 115
Albuquerque, NM 87102-3497

Rocky Mountain Research Station

EXECUTIVE SUMMARY

This report summarizes nest-monitoring efforts for the Southwestern willow flycatcher (*Empidonax trailli extimus*) in the Cliff-Gila Valley, New Mexico during the 2002 breeding season. We located and monitored 133 nests. In contrast to the previous two years, these were found to have an unfortunately high failure rate due to high depredation and very few second brood attempts. The rate of brood parasitism by the brown-headed cowbird (*Molothrus ater*) (17.2%), although similar to 2001, is relatively high when compared with previous years. We found that for nests constructed in boxelder (*Acer negundo*) the success rate was higher and brood parasitism rate was lower when the nest was placed higher and/or built in a taller tree.

In general, there was a notable movement of flycatcher territories to younger patches of Fremont cottonwood (*Populus fremontii*), Gooding's willow (*Salix gooddingii*) and coyote willow (*Salix exigua*) growing on wetter soils within the active channel of the floodplain. Although boxelder was used for substrate for a majority of the nests (65.1%), this is considerably lower than in previous years and corresponds with a significant increase in the use of willow species. The migration to younger substrate and a low nest success rate correlate with an extremely dry early season exacerbated by sustained drought.

INTRODUCTION

The southwestern willow flycatcher (*Empidonax trailli extimus)* is a small songbird that migrates to the southwestern United States to breed in dense riparian vegetation along river corridors. The flycatcher typically arrives on the breeding ground from May to June and stays for it's short breeding season before migrating back to the winter grounds in Latin America by the end of August (Sedgewick 2000).

A decline in the number of the southwestern willow flycatcher resulted in the U.S. Fish and Wildlife Service listing the subspecies as Endangered in 1995 (USFW 2001). It is currently considered the top priority species for US Fish and Wildlife Service Region 2. Declines have been attributed primarily to a loss and alteration of riparian habitat associated with anthropomorphic influence on floodplains that resulted in a reduction of water levels and degraded habitat (USFW 2001). Although brood parasitism by the brown-headed cowbird (*Molothrus ater*) has also been listed as a threat to the flycatcher (USFW 2001), it may not be a primary threat to larger populations as long as adequate habitat is available and productivity rates are high enough to offset the adverse affects (Sedgwick and Iko 1999, USFW 2001). Approximately 900 pairs of the Southwestern willow flycatcher were known to exist in 2000, with the largest population in the upper Gila River Valley in New Mexico (USFWS 2001).

OBJECTIVES

Our goals for the 2002 breeding season study were:

1. Monitor the health of a significant population of breeding southwestern willow flycatchers in the Cliff-Gila Valley.

2. Study nesting biology of the willow flycatcher by locating nests, determining levels of success, and determining rates of Brown-headed cowbird brood parasitism and predation.

3. Characterize and quantify vegetation at the nesting territories.

METHODS

STUDY SITE

The Gila River Valley opens onto a broad alluvial floodplain as the river leaves the mountains of the Gila Wilderness. The upstream end of this wide valley begins at the Mogollon Creek inlet (33º 55′ N, 108º 35′ W) and from here the river runs south-southwest through the Cliff-Gila Valley for approximately 18 km. The study was primarily conducted from just below the US Route 180 Bridge upstream to the north end of the U-Bar Ranch along approximately 8 km of river (Figure 1). In addition, flycatchers were studied in the Gila Bird Area, a riparian restoration project comprised of land holdings of the Gila National Forest and Pacific-Western Land Company, located some 11 km downstream of the Route 180 Bridge. Most of the Cliff-Gila Valley consists of irrigated and non-irrigated pastures used for livestock production and hay farming. Elevations range from 1350 to 1420 m.

The Gila River and nearby earthen irrigation ditches are lined with riparian woodland patches of various ages and composition. Most mature patches support a woodland community of Fremont Cottonwood-Gooding Willow/Boxelder (*Populus fremontii-Salix gooddingii/Acer negundo*) (modified from Muldavin et al. 2000). This community type is well represented in the Cliff-Gila Valley and is characterized by a mature cottonwood overstory (>25m high) with an understory dominated by stands of boxelder and Gooding's willow forming a dense understory canopy. In many stands the boxelder is the most common tree, forming a closed subcanopy gallery forest. Arizona walnut (*Juglans majoris),* velvet ash (*Fraxinus velutina),* and Arizona sycamore (*Plantar wrightii)* occur as sub-canopy associates. The shrub layer is sparse because of the shade of the dense forest canopy but includes three-leaf sumac (*Rhus trilobata*), false indigo (*Amorpha fruticosa*), and New Mexico olive (*Forestieria neomexicana*). The groundcover consists of forbs and grasses. Most young patches support a Fremont Cottonwood-Gooding Willow/Coyote Willow (*Salix exigua*) community type (Muldavin et al. 2000). This type is typically found on low to mid-elevation bars within the active channel and often grows along inactive meander paths. Narrow patches of young to middle-aged stands of cottonwood and Gooding willow with an understory dominated by coyote willow are characteristic. Saplings of boxelder and other wetland indicators such as seepwillow (*Baccharis salicifolia*) and bluestem willow (*Salix irrorata*) can be present in the understory. The herbaceous layer is usually well developed and supports a diversity of native obligate wetland species. The gravel bars within the active channel support early-successional growth of wetland shrub communities comprised

mainly of coyote willow and seepwillow.

NEST MONITORING

We searched for nests of Willow Flycatchers and other species on a daily basis. Nests were monitored every 3-7 days, following a modified (less-intrusive) version of protocols proposed by the Arizona Game and Fish Department (Rourke et al. 1999). Nest contents were observed using pole-mounted mirrors or video cameras. Nests that were abandoned or destroyed were examined for evidence (e.g., cowbird eggs, mammal hairs) to ascertain causes of nest failure. We considered a nest successful if: (1) parent birds were observed feeding one or more fledged young; (2) parent birds behaved as if dependent young were nearby when the nest was empty (defensive or agitated behavior near nest); or (3) nestlings were in the nest within one or two days of the estimated fledge date. We considered a nest failed if: (1) nest contents disappeared before fledging of young was possible, assuming 10-12 d required for fledging (depredation), (2) the nest contained no Willow Flycatcher young but contained cowbird eggs or chicks (parasitized), (3) the nest was deserted after eggs had been laid (desertion), or (4) the nest was abandoned prior to egg laying (abandonment).

RESULTS

WILLOW FLYCATCHER BREEDING RESULTS

The 2002 breeding season was similar to last year's in terms of the number of nests found, but unlike in 2001, the flycatchers suffered a relatively high rate of nest failure. We located and monitored 126 nests and an additional seven pair that were feeding fledglings where no nest was found. In contrast to previous years, the number of nests successfully fledging one or more young was only 34.4% (compare with 67% in 2001). In addition, there were very few pairs that attempted to raise a second brood after successfully fledging a first. Of those that did, none were successful.

NEST STATISTICS

Of the 133 nesting efforts by the flycatcher, 44 were successful (34.4%), 84 failed (65.6%), and we were unable to ascertain the outcome of five. A majority of the failures were a result of predation (n = 24) or nest abandonment before eggs were laid (n = 22) (Table 1). Nests were recorded as abandoned if activity ceased before incubation began. However, it is possible that between

observations, incubation began and eggs were depredated, or broods were parasitized and subsequently abandoned, resulting in an overestimation of abandonment and an underestimation of the other failure types.

The proportion of nests that failed due to predators (18%) was a higher than reported in previous years. Even though the depredation rate we observed is high, it is most likely an underestimation as a majority of the 17 nests that failed for unknown reasons and some of the aforementioned abandoned nests more than likely should be added to the count. Predation of a nest can contribute to a lower probability of a nest reattempt because there is an increased risk of predation on the incubating female, although this phenomenon is not readily documented (USFW 2001). We documented two incidents where female flycatchers were found to be missing either the entire tail or most of the tail feathers on a visit when a recently active nest failed, presumably lost escaping a predator. On two additional occasions, a nest was predated and the female was not observed on the next visit although the male was still in the area singing frequently.

The rate of brood parasitism by the brown-headed cowbird (17.2%) was similar to 2001 (16.5%). Six of the 22 parasitized nests were abandoned and the pair renested nearby, 5 nests fledged cowbird young, and 5 were subsequently depredated, never fledging either host or cowbird young. One nest failed due to weather when it's sheltering patch of cottonwood/willow dropped all of its leaves from water stress in the extremely dry, early-breeding season. We were unable to determine the precise reason activity ceased at the remaining 6 nests, however it is doubtful any of these fledged cowbirds because the nestlings and fledglings have a distinct, buzzy begging call that is easy to detect. Despite a high predation rate and a low success rate the flycatcher population produced at least 58 young in 2002. This is probably an underestimate because, in order to minimize disturbance, we left a territory as soon as we determined the nest status and once a single fledgling was observed or parents seen carrying food, the nest was considered successful.

A majority of the flycatchers departed from the breeding territories during the third week of July in what was a remarkably abrupt departure (Figure 2). As an example, on July 16th it was estimated that 13 pairs were occupying territories in one of the larger forest patches (Northwest 4), while on the 29th only two pair still occupied the area and 4 territories that had nesting activity recorded on the previous visit had been completely vacated. The unusually dry early summer may have been a contributing factor in the early departure by the flycatchers. A

similar pattern of low nest success and rapid departure from breeding sites was observed throughout Arizona (E. Paxton, pers. comm.).

NEST SITE ANALYSIS

Nest tree species used by the flycatcher were the same as previous years but the proportion in which they were used was not. Boxelder was again the preferred nest substrate (61.5%) (Table 2); however, the rate was remarkably lower than the previous two breeding seasons (81% and 84%). As usual, the highest nests were in boxelder, which is a reflection of the taller tree height. During 2002, Gooding's willow (18.3%) and coyote willow (11.9%) were used in greater proportion than in previous years. In 2001, nests were placed in Gooding's willow 7% of the time and in coyote willow less than 1% of the time. As a result of the high usage of willow in 2002, the average nest height (6.8±3.7m) was lower than in previous years. Nests in the Cliff-Gila Valley remained notably higher than in other populations (USFW 2001).

Nest placement had significant effects on the nest outcome, which varied according to tree species. Based on single factor ANOVA analysis, nests in boxelder were significantly higher for unparasitized nests than those that were victims of brood parasitism ($p = 0.005$). Nests with successful outcomes were marginally higher than failed nests, but this effect was not quite statistically significant ($p = 0.053$). For nests built in Gooding's willow, the average nest height was greater for successful and unparasitized nests, but the difference was not found to be statistically significant. There were no significant differences for the nests in coyote willow either but interestingly, successful nests and unparasitized nest heights averaged *lower* than the failed attempts. This can be partly explained by the uniform canopy structure in the coyote willow patches. Nests that are higher may be more visible to a predator or cowbird overhead.

The change in proportional use of different nest substrates used by the flycatcher during the 2002 breeding season is a reflection of this year's general movement of territories to younger patches growing on wetter soils. The Gooding's willows that were used as nest substrate are younger trees found in patches mixed with young cottonwoods, coyote willows and bluestem willows, and were found in areas of saturated soils, often on the active river channel. A comparison of the number of flycatchers occupying each patch between this year and past years confirms a general movement to younger patches. Manifestations of this trend include fewer birds in a mature patch, nest building in young vegetation within a large patch, and increasing numbers of territories in a younger patch. The southwest stringer is a mature patch of mostly boxelder and

Gooding's willow lining an irrigation ditch that ran infrequently and is at minimum 400m from the river. The number of birds occupying the southwest stringer declined this past summer. Southeast 1 (SE1) is the largest patch in the valley (6.6 hectares) that is occupied by flycatchers. Seven of the 16 nests found in SE1 in 2002 were in the early successional growth along the edge of the patch, most of which is below the main terrace on the active floodplain (Figure 3). Adjacent to Northeast 1 (NE1) and along a series of ponds that demarcate a recently used river channel, discontinuous patches of young cottonwood-willow supported 4 pairs this year, up from only one pair in 2001, which was the first year of flycatcher occupation.

BENNETT

The highlight of the 2002 breeding season was a notable increase of flycatchers occupying the Bennett restoration project. In 1995, the U-bar Ranch initiated a riparian restoration project in order to stabilize eroding banks. Flycatchers have occupied the site in increasing numbers, starting with two breeding pairs documented in 1999, six in 2001, and a minimum of 14 in 2002. Most of the flycatchers occupy a long linear patch of young Gooding's willow, cottonwood and coyote willow surrounding a series of ponds. This patch was highly productive with 8 of 10 pairs successfully fledging young. Cowbird parasitism was notably low even though there were a considerable number of cowbirds calling within the patch during the early season.

DISCUSSION

CLIMATIC INFLUENCES ON FLYCATCHER POPULATION DYNAMICS

New Mexico's southwest mountain region has experienced a severe and prolonged drought (New Mexico Climate Center (NMCC)). A drop in the number of flycatchers in the valley after a peak of 247 pairs in 1999 coincides with the onset of the drought. In 1999, the Cliff weather station had the lowest amount of precipitation on record since 1971. Over 11 inches fell during July and August that year but were followed with a scant 1.3 inches of precipitation in the next eight months. The following year the population dropped to 139 pairs. Rainfall was below normal in 2000 and 2001 as well (NMCC).

For the 12-month period ending May 31, 2002, the statewide average precipitation was the sixth lowest of the past 107 years (NMCC). During the early nesting season, the valley received only negligible rainfall and outside of one rain event in June, it wasn't until July 10th that the first significant rain fell (>0.03 inch) (note that this was already past the peak of flycatcher breeding

activity). The amount of precipitation for the month of July was above average (Figure 4), but 49% of the month's rain was received during three days at the end of the month (26th – 28th), after most flycatchers had left the site.

Temperatures were also well above normal during the main part of the breeding season (Figure 5). The state of New Mexico experienced the 5th warmest June on record (NCDC) and temperatures in the Cliff-Gila Valley were 2.6°F above the average until the yearly rains arrived in early mid-July.

In 2002, breeding flycatchers in the Gila Valley suffered a low nesting success rate compared to previous years. Drought has been shown to have an adverse effect on avian productivity (Rotenberry *et al.* 1992) and abundant water has been shown to be a critical factor affecting willow flycatcher settlement and nesting success (Sogge *et al.* 1997, Johnson *et al.* 1999). Possible factors for this year's decline in nest success are related to climatic stress and include higher depredation rates, possible decline in insect-prey abundance, and early departure that would lower the probability of a second-brood attempt. Another factor may be the reduced proportion of nests placed in boxelder. A regression analysis of the impact of proportion of nests in boxelder on annual nest success revealed a strong positive correlation ($r^2 = 0.84$, $F_{1,4} = 9.8$, $p = 0.035$). The movement of flycatchers away from boxelder-dominated mature patches to younger, wetter patches without boxelder probably had a profound effect on nest success.

Another manifestation of this season's drier climate was the general movement of flycatcher territories to younger vegetation on wetter soils. Mature patches on terraces are subject to vegetation stress from lowered water-table levels, while the young patches on the active floodplain proximal to open water are less affected. Stochastic declines in prey availability due to climatic stress in the higher mature patches may have been a factor for territory migration to younger, smaller patches as well as a potential source for a general decline in nesting productivity. Although prey availability was not found to coincide with flycatcher densities in the Cliff-Gila Valley (Stoleson and Finch 2002), that study did not compare relative prey densities in mature and young patches. It is probable that arthropod diversity fluctuated stochastically in response to dry conditions; aquatic species that breed in open water would be especially vulnerable. Potential for further decrease in arthropod diversity in the mature patches may have promoted migration of the flycatcher population to the younger, wetter sites.

MANAGEMENT IMPLICATIONS

Habitat should be the focus for management of the willow flycatcher population in the Cliff-Gila Valley. Suitable habitat may vary and migration to the young narrow patches may continue in the event of sustained drought. Extensive young cottonwood-willow patches similar to the Bennett project, or young patches that are sheltered by an adjacent larger, more mature patch (e.g., SE1), provide nesting substrate that appears less susceptible to failure than the naturally limited and isolated patches and should be nurtured for maximum growth. Taller boxelder trees promote productivity; therefore, the mature forest supporting dense tall boxelder galleries should also be nurtured with consistent irrigation if drought continues.

ACKNOWLEDGEMENTS

We thank A. Hagen, A. Thompson for field assistance, and D. Nolan of the National Weather Service for providing data. We thank Ty Bays and Charles Rose of Phelps Dodge Corp., and R. Pope and R. Ward of the Gila N.F. for logistical and financial support. We are grateful to Dave and Tammy Olgalvie for allowing access and readily being available for assistance. This work was funded by Phelps-Dodge Corp. and the Quivira Coalition.

Cover Illustration: Headwaters Environmental Center, Ashland Oregon.

REFERENCES

Muldavin, E., P. Durkin, M. Bradley, M. Stuever, and P. Mehlhop. 2000. Handbook of wetland vegetation communities of New Mexico, Volume 1: classification and community descriptions. New Mexico Heritage Program, University of New Mexico, Albuquerque, New Mexico.

National Climatic Data Center (NCDC). Data online at URL = http://lwf.ncdc.noaa.gov/oa/climate/research/2002.

New Mexico Climate Center (NMCC). Data online at URL = http://weather.nmsu.edu

Rotenberry, J. T., R. J. Cooper, J. M. Wunderle, and K. G. Smith. 1992. Incorporating effects of natural disturbances in managed ecosystems. *In*, Finch, D. M. and P. W. Stangel, eds. Status and management of neotropical migratory birds. General Technical Report RM-229. Rocky Mountain Forest and Range Experiment Station, U. S. Department of Agriculture, Fort Collins, Colorado.

Rourke, J. W., T. D. McCarthey, R. F. Davidson, and A. M. Santaniello. 1999. Nongame and Endangered Wildlife Program Technical Report, 144: Southwestern Willow Flycatcher nest monitoring protocol. Phoenix, AZ, Arizona Game and Fish Department.

Johnson, K., P. Melhop, C. Black, and K. Score. 1999. Reproductive failure of endangered southwestern willow flycatchers on the Rio Grande, New Mexico. Southwestern Naturalist 44: 226-231

Sedgwick, J. A. 2000. The Birds of North America, No. 533: Willow Flycatcher. The Birds of North America, Inc., Philadelphia, PA.

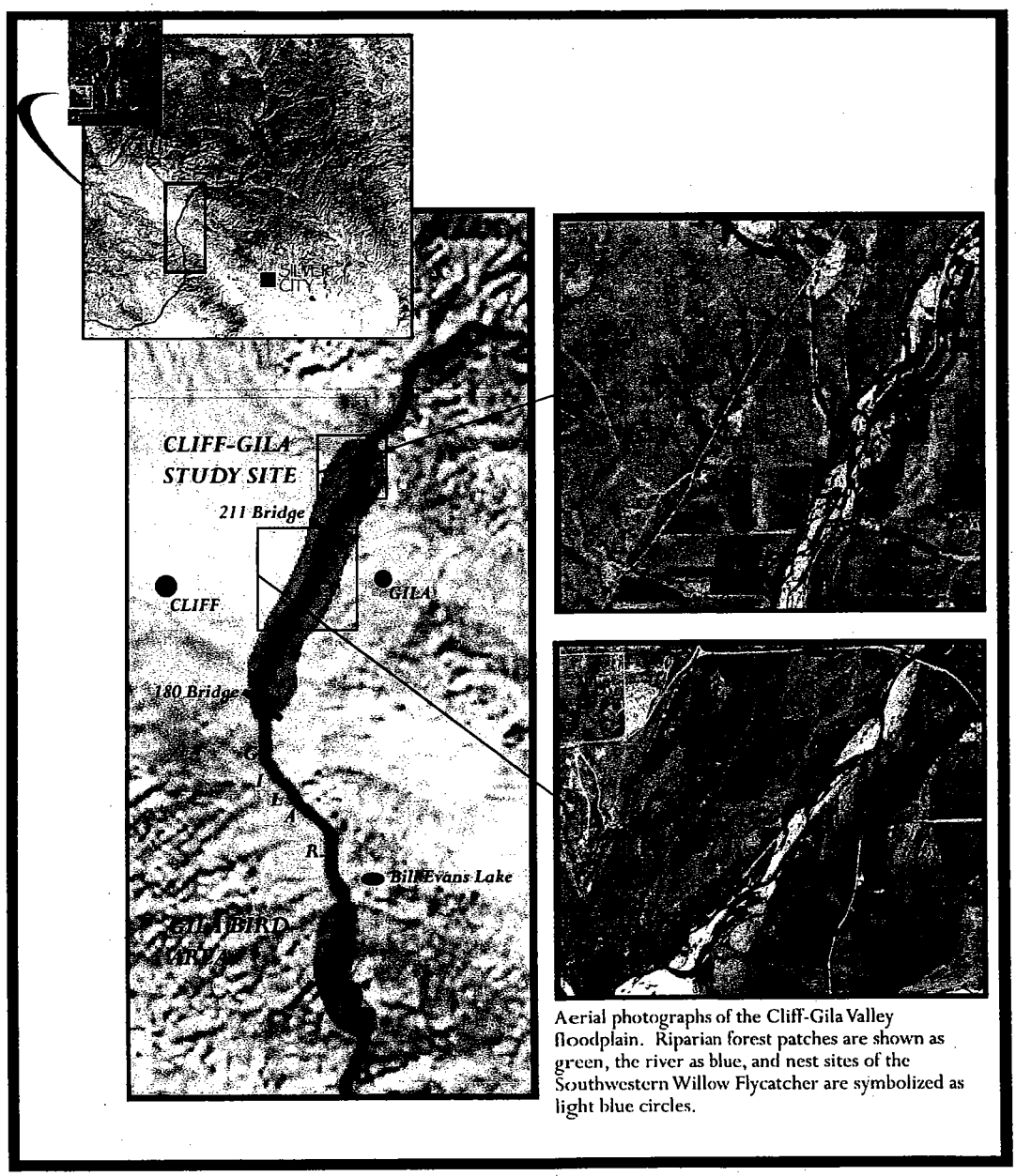
Sedgwick, J. A., and W. M. Iko. 1999. Costs of Brown-headed Cowbird parasitism to Willow Flycatchers. Studies in Avian Biology 18: 167:181.

Stoleson, S. H and D. M. Finch. 2002. Southwestern willow flycatchers in the Cliff-Gila Valley: Survey results, nest monitoring, and a preliminary analysis of willow flycatcher diet; summary report for the 2001 field season.

Sogge, M. K., R. M. Marshall, S. J. Sferra, and T. J. Tibbitts. 1997. A Southwestern Willow Flycatcher Natural History Summary and Survey Protocol. National Park Service Technical Report, NPS/NAUCPRS/NRTR-97/12. Flagstaff, AZ.

U.S. Fish and Wildlife Service. 2001. Southwestern Willow Flycatcher Recovery Plan. Albuquerque, NM.

Figure 1. Map of the Gila River study sites and color-enhanced aerial photography of the valley. Inset shows the state of New Mexico and the southwest region with an outline of the study site along the Gila River.



Aerial photographs of the Cliff-Gila Valley floodplain. Riparian forest patches are shown as green, the river as blue, and nest sites of the Southwestern Willow Flycatcher are symbolized as light blue circles.

Figure 2. Chronology of flycatcher nest activity.

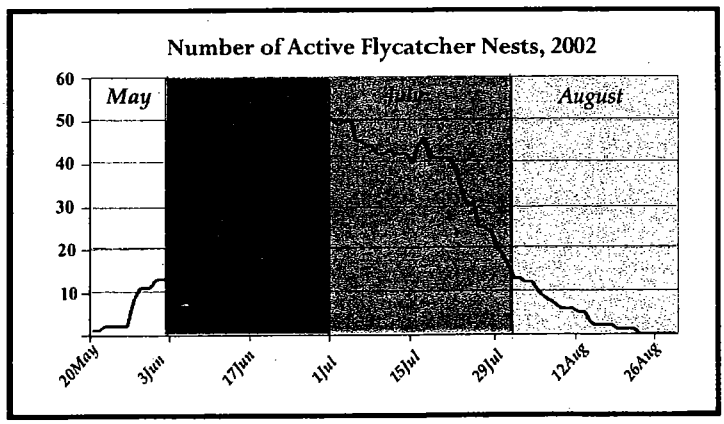


Figure 3. Color-enhanced aerial photography showing the large proportion of nests built in young willows along the edge of large forested patch.

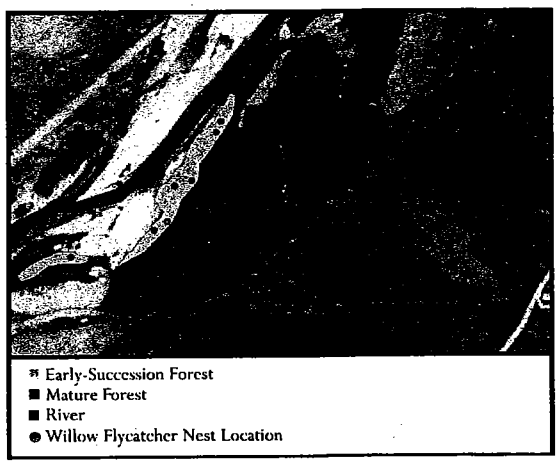


Figure 4. Graph of precipitation data from 2002 compared with the long-term average. Data from the National Climatic Data Center.

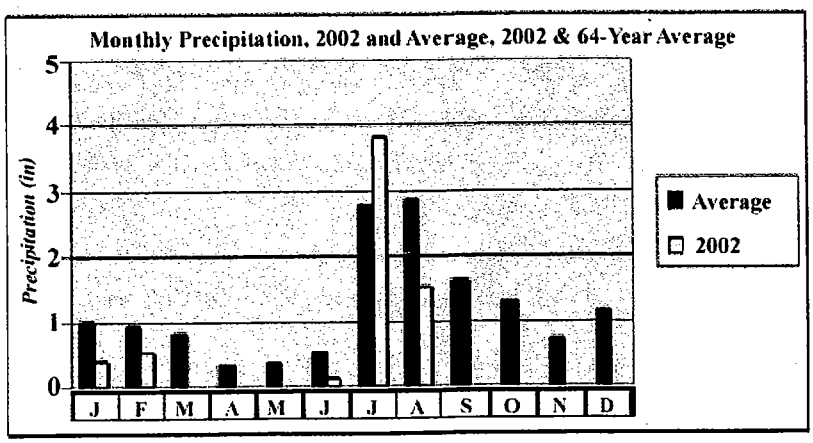


Figure 5. Graph of temperature data from 2002 compared with the long-term average. Data from the National Climatic Data Center.

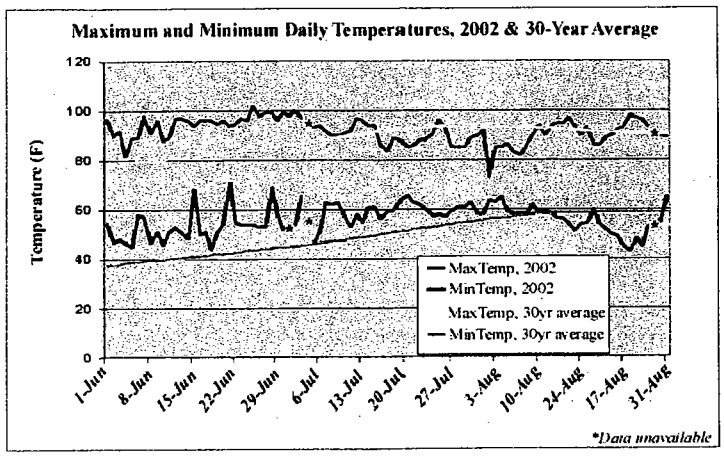


Table 1. Breakdown of Willow Flycatcher breeding outcome, 2002.

Flycatcher Nest Outcome		
	n	%
Success	44	34.4
Fail	84	65.6
Unknown	5	
Total	133	100

Type of Nest Failure	n	%
Depredation	24	18.8
Cowbird Parasitism	22*	17.2
abandoned	6	
fledged	5	
other	11	
Abandoned	22	18.8
Unknown	17	13.3
Weather	1	0.8

* *Discrepency between total number of failed nests in the Outcome table and the sum of the types of failure is a result of counting two depredated nests containing flycatcher nestlings and cowbird eggs in both the depredated and parasitized categories.*